

REMARKS

This is intended as a full and complete response to the Office Action dated March 13, 2008, having a shortened statutory period for response set to expire on June 13, 2008. Please reconsider the claims pending in the application for reasons discussed below.

CLAIM OBJECTIONS

Claims 8, 20 and 59 stand objected due to informalities. In response, the Applicants have amended claims 8, 20 and 59 for claim language consistency. Accordingly, the Applicants respectfully request the claim objection be withdrawn.

CLAIM REJECTIONS

35 U.S.C. §112 Claims 31-33 and 53-58

Claims 31-33 and 53-58 are rejected under 35 U.S.C. 112 first paragraph. In response, the Applicants respectfully direct Examiner's attention to paragraph 21, lines 6-9 of the specification, it states "The copper precipitate deposits or coats the barrier layer to form the copper seed layer. Once the barrier layer has a copper seed layer deposited upon, the barrier layer is protected and shielded from metal dissolution processes at less negative potentials." Accordingly, based on the description, the copper precipitate is deposited and coated on the barrier layer. No other intervening layer is formed therebetween in the processing of electroplating the copper seed layer on the barrier layer. Therefore, the Applicants respectfully submit that the description "the copper seed layer is directly formed on the barrier surface without intervening layer disposed therebetween" is supported in paragraph 21 of the specification of the present application, and respectfully request the rejection withdrawn and claim allowed.

35 U.S.C. §112 Claims 37, 47-51 and 54-58

Claims 37, 47-51 and 54-58 are rejected under 35 U.S.C. 112 second paragraph. In response, the Applicants have cancelled claim 37, 47 and 54 and amended claims 47 and 54 to more clearly recite certain aspect of the invention. Accordingly, the Applicants believe that all claims are all in allowable form and respectfully request the claim rejection withdrawn.

35 U.S.C. §103(a) Claims 8-9 and 37-44

Claims 8-9 and 37-44 stand rejected as being unpatentable over *JP'600* (JP 2002-76000) in combination with *Wang* (U.S. Patent Publication No. 2005/0020068), *Dubin* (U.S. Patent No. 6432821) and further in view of *Nogami* (U.S. Patent No. 6528412). In response, the Applicants have amended claim 8 and cancelled claim 38 to more clearly recite certain aspects of the invention.

Independent claim 8 recites elements not taught or suggested by the combination of *JP'600*, *Wang*, *Dubin* and *Nogami*. *JP'600* teaches plating a seed layer on a barrier layer surface by an electrolytic plating method. However, *JP'600* is silent regarding the copper source that may be used to deposit the copper seed layer.

Wang is cited and relied on to cure the deficiency of *JP'600*. However, *Wang* does not teach or suggest using a copper ion source and at least one EDTA ligand as a copper source to provide complexed copper ions to directly electroplating a seed layer on a barrier layer.

More specifically, *Wang* teaches using free copper ions to deposit a seed layer. *Wang* does not teach or suggest using a copper ion source and at least one EDTA ligand as a copper source to provide complexed copper ions to directly electroplate a seed layer on a barrier layer.

Dubin teaches using multiple steps to electroplating copper on a seed layer. *Nogami* teaches a method to anneal a copper seed layer. However, neither *JP'600*, *Wang*, *Dubin* nor *Nogami*, alone in combination, teaches or suggests using a copper ion source and at least one EDTA ligand as a copper source to provide complexed copper ions to directly electroplate a seed layer on a barrier

layer. More specifically, none of the cited references teaches or suggests exposing a substrate to a complexed copper solution comprising complexed copper ions derived from a copper source and at least one EDTA ligand, and the substrate has a barrier layer and the barrier layer does not have another layer disposed thereon, as recited by claim 8. As such, a *prima facie* case of obviousness has not been established as the references fail to teach each claimed element.

Thus, the Applicants submit that independent claim 8, and all claims depending therefrom, are patentable over *JP'600* in view of *Wang* and in view of *Dubin* and further in view of *Nogami*. Accordingly, the Applicants respectfully request the rejection be withdrawn.

35 U.S.C. §103(a) Claim 10

Claim 10 stands rejected as being unpatentable over *JP'600* in combination of *Wang*, *Dubin*, *Nogami* and further in view of *Nagai* (U.S. Patent No. 6709563). In response, the Applicants have amended claim 8 to more clearly recite certain aspect of the invention.

Independent claim 8 recites elements not taught or suggested by the combination of *JP'600*, *Wang*, *Dubin*, *Nogami* and *Nagai*. The patentability of claim 8 over *JP'600*, *Wang*, *Dubin*, and *Nogami* has been discussed above. *Nagai* teaches a plating liquid containing divalent copper ions, a completing agent and an optional pH adjusting agent. However, there is no teaching or suggestion from *Nagai* that would suggest to one of ordinary skill in the art to modify *JP'600*, *Wang*, *Dubin*, and *Nogami* in a manner that would yield exposing a substrate to a complexed copper solution comprising complexed copper ions derived from a copper ion source and at least one EDTA ligand, and the substrate has a barrier layer and the barrier layer does not have another layer disposed thereon, as recited by claim 8.

Thus, the Applicants submit that claim 10, that depends from claim 8, is patentable over *JP'600* in view of *Wang, Dubin, Nogami* and further in view of *Nagai*. Accordingly, the Applicants respectfully request the rejection be withdrawn.

35 U.S.C. §103(a) Claims 20-21 and 45-52

Claims 20-21 and 45-52 stand rejected as being unpatentable over *JP'600* in view of *Wang, Dubin* and *Nogami*. In response, the Applicants have amended claims 20 and 48 and cancelled 45-47 to more clearly recite certain aspects of the invention.

As discussed, the combination of *JP'600, Wang, Dubin* and *Nogami* does not teach or suggest exposing a substrate to a complexed copper solution comprising complexed copper ions to chemically reduce complexed copper ions with a first electrical bias to form a copper seed layer on a barrier surface, wherein the complexed copper ion is from a compound having a copper ion source and at least one EDTA ligand and the barrier surface has no material layer formed thereon, as recited by independent claim 20. As such, a *prima facie* case of obviousness has not been established as the references fail to teach each claimed elements.

Thus, the Applicants submit that claim 20, and claims 21 and 45-52 depending therefrom, are patentable over *JP'600* in view of *Wang* in view of *Dubin* and in view of *Nogami*. Accordingly, the Applicants respectfully request the rejection be withdrawn.

35 U.S.C. §103(a) Claim 22

Claim 22 stands rejected as being unpatentable over *JP'600* in view of *Wang* and in view of *Dubin* further in view of *Nogami* and *Nagai*. In response, the Applicants have amended claim 20 to more clearly recite certain aspects of the invention.

As discussed, the combination of *JP'600*, *Wang*, *Dubin*, *Nogami* and *Nagai* does not teach or suggest exposing a substrate to a complexed copper solution comprising complexed copper ions to chemically reduce complexed copper ions with a first electrical bias to form a copper seed layer on a barrier surface, wherein the complexed copper ion is from a compound having a copper ion source and at least one EDTA ligand and the barrier surface has no material layer formed thereon, as recited by independent claim 20, from which claim 22 depends. As such, a *prima facie* case of obviousness has not been established as the references fail to teach each claimed elements.

Thus, the Applicants submit that claim 22, that depends from claim 20, is patentable over *JP'600* in view of *Wang* in view of *Dubin* and further in view of *Nogami* and in view of *Nagai*. Accordingly, the Applicants respectfully request the rejection be withdrawn.

35 U.S.C. §103(a) Claims 31-32 and 53-58

Claims 31-32 and 53-58 stand rejected as being unpatentable over *JP'600* in view of *Wang* and further in view of *Dubin*. In response, the Applicants have amended claim 31 and cancelled claim 54 to more clearly recite certain aspects of the invention.

As discussed, the combination of *JP'600*, *Wang* and *Dubin* does not teach or suggest exposing a substrate to a complexed copper solution comprising complexed copper ions derived from a copper ion source and at least one EDTA ligand, and the substrate has a barrier surface and the barrier layer does not have a copper layer disposed thereon, as recited by independent claim 31. As such, a *prima facie* case of obviousness has not been established as the references fail to teach each claimed elements.

Thus, the Applicants submit that independent claim 31, and claims 32 and 53-58 depending therefrom, are patentable over *JP'600* in view of *Wang* in view of *Dubin* and further in view of *Wang*. Accordingly, the Applicants respectfully request the rejection be withdrawn.

35 U.S.C. §103(a) Claim 33

Claim 33 stands rejected as being unpatentable over *JP'600* in view of *Wang* and further in view of *Dubin* and *Nagai*. In response, the Applicants have amended claim 31 to more clearly recite certain aspects of the invention.

As discussed, the combination of *JP'600*, *Wang* and *Dubin* does not teach or suggest exposing a substrate to a complexed copper solution comprising complexed copper ions derived from a copper ion source and at least one EDTA ligand, and the substrate has a barrier surface and the substrate has a barrier surface and the barrier layer does not have a copper layer disposed thereon, as recited by independent claim 31, from which claim 33 depends. As discussed above, *Nagai* does not bridge the deficiencies of the combination of *JP'600*, *Wang* and *Dubin*. As such, a *prima facie* case of obviousness has not been established as the references fail to teach each claimed elements.

Thus, the Applicants submit that claim 33, that depends from claim 31, is patentable over *JP'600* in view of *Wang* and further in view of *Dubin* and *Nagai*. Accordingly, the Applicants respectfully request the rejection be withdrawn.

35 U.S.C. §103(a) Claim 59

Claim 59 stands rejected as being unpatentable over *JP'600* in view of *Dubin* ('217) (U.S. Patent Publication No. 2004/0108217) and in view of *Wang*, and in view of *Nogami* and further in view of *Chen* (U.S. Patent No 7192494). In response, the Applicants have amended claim 59 to more clearly recite certain aspects of the invention.

As discussed, the combination of *JP'600*, *Dubin*, *Wang* and *Nogami* does not teach or suggest using a copper ion source and at least one EDTA ligand as a copper source to provide complexed copper ions to directly electroplate a seed layer on a barrier layer. *Dubin* ('217) teaches electroplating a copper layer for metal interconnection. *Chen* teaches a method of annealing a copper layer. However, there is not teaching or suggestion from *Dubin* ('217) or *Chen* that would suggest to one of ordinary skill in the art to modify *JP'600*, *Dubin*, *Wang* in a manner that would yield applying a first electrical bias across a substrate

surface to chemically reduce the complexed copper ions and to form a copper seed layer onto the ruthenium barrier layer, wherein the complexed copper ion is from a compound having a copper ion source and at least one EDTA ligand, and the ruthenium barrier layer does not have another layer disposed thereon, as recited by claim 59. As such, a *prima facie* case of obviousness has not been established as the references fail to teach each claimed elements.

Thus, the Applicants submit that independent claim 59, is patentable over JP'600, Dubin, Wang and further in view of Dubin ('217) and further in view of Chen. Accordingly, the Applicants respectfully request the rejection be withdrawn.

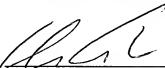
CONCLUSION

Thus, for at least the reasons discussed above, the Applicants submit that all claims now pending are in condition for allowance. Accordingly, both reconsideration of this application and its swift passage to issuance are earnestly solicited.

If, however, the Examiner believes that any unresolved issues still exist, it is requested that the Examiner telephone Mr. Keith Taboada at (732) 530-9404 so that appropriate arrangements can be made for resolving such issues as expeditiously as possible.

Respectfully submitted,

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